**PATENT**
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# APPLICATION FOR UNITED STATES LETTERS PATENT

**FOR**

# GAMING MACHINE WITH ELECTRO-MAGNETIC INTERFERENCE SHIELDING

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# GAMING MACHINE WITH ELECTRO-MAGNETIC INTERFERENCE SHIELDING

## FIELD OF THE INVENTION

The present invention relates generally to gaming machines and, more specifically, to a gaming machine with electromagnetic interference shielding. The shielding may, for example, be in the form of a transparent, conductive layer or coating on the main reel display glass, conductive paint on plastic bezels installed around the display(s), tracking card input device, bill input device, and other externally visible devices designed with finishing bezels, and conductive material impregnated in the composition of the finishing bezels and display glass.

## BACKGROUND OF THE INVENTION

Gaming machines, such as slot machines, video poker machines and the like, have been a cornerstone of the gaming industry for several years. Generally, the popularity of such machines with players is dependent on the likelihood (or perceived likelihood) of winning money at the machine and the intrinsic entertainment value of the machine relative to other available gaming options. Players also appreciate the reliability of a gaming machine, as do the casino operators. Shrewd operators consequently strive to employ the most entertaining, exciting, and reliable machines available because such machines attract frequent play and hence increase profitability to the operator.

For many years, the electronics industry has been dealing with the issue of electromagnetic interference (EMI) and electrostatic discharge (ESD) immunity. These topics have been the subject of regulations promulgated by the Federal Communications Commission (FCC) and international governing bodies such as the International Electrotechnical Commission (IEC) and the European Committee for Electrotechnical Standardization (CENELEC). The gaming industry, handed the same restrictions for emission of electro-magnetic energy, is also faced with security risks attributed to the introduction of interference (intentional or otherwise) into the gaming machine. Electro-magnetic interference includes electrostatic, radio frequency, and magnetic energy. Because of these potential threats to the integrity of the gaming device and the jurisdictional regulations imposed on the gaming industry regarding

the machine's security, it is imperative that proper shielding techniques be used to prevent interference from outside sources.

A variety of techniques have been used to prevent interference and contain internal emissions. Depending on the design of the electronic device, a combination of standard and custom shielding components and techniques have been used and are available to gaming machine manufacturers today. In many instances, modular assemblies inside the gaming machine's main cabinet, such as main processor boards, controller boards, power supply units, and display units, are shielded in metal enclosures, isolating the assembly from external interference and containing much of the emissions generated by the assembly.

Because gaming machines are visual entertainment devices, certain areas of the machine are susceptible to external interference. Most notably, mechanical and video displays and externally accessible devices, using plastic bezels to "finish the look", create apertures in the machine and, in some cases, in the shielding used to prevent interference and contain emissions. A conditional solution for the display is to cover it with glass that contains copper tape in predetermined locations on the reverse side (hidden from view). This reduces the area susceptible to interference, but because certain areas of the display glass must be transparent in order for the player to see, potential interference cannot be eliminated completely. Another drawback to copper tape is that it is labor intensive since each glass cover must be taped by hand thus adding to the production time and cost of the gaming machine.

Plastic bezels pose another area of risk because plastic is not conductive and does not shield against outside interference. The addition of metal to the reverse side of the bezels greatly increases cost.

To increase consistent shielding to the display and bezel areas on a gaming machine, a shielding substance or coating is needed on certain externally viewable components to eliminate outside interference.

## SUMMARY OF THE INVENTION

The present invention provides a transparent, conductive coating that may, for example, cover the entire display glass, a conductive paint or coating applied to plastic bezels, and plastic bezels impregnated with conductive material, resolving the interference issues common to the areas these components occupy.

## BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

FIG. 1 is a perspective view of a gaming machine with display glass and plastic bezels on which conductive coatings have been applied, in accordance with the present invention;

FIG. 2 is a block diagram of a control system suitable for operating the gaming machine;

FIG. 3 is an exploded perspective view of a main display assembly including a face frame, a plastic bezel, a display glass, and a mechanical reel assembly;

FIG. 4 is a perspective view of the plastic bezel;

FIG. 5 is a front view of a prior art display glass with copper tape affixed thereto; and

FIG. 6 is a cross-sectional view of the display glass and its surrounding plastic bezel on which conductive coatings have been applied.

While the invention is susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and will be described in detail herein. However, it should be understood that the invention is not intended to be limited to the particular forms disclosed. Rather, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

## DESCRIPTION OF SPECIFIC EMBODIMENTS

FIG. 1 depicts a gaming machine 10 operable to conduct a slot-based wagering game. In operation, the gaming machine receives a wager from a player to purchase a "play" of the game. In a "play" of the game, the gaming machine generates at least one random event and provides an award to the player for a winning outcome of the random event. The random event may be internally or remotely determined using a random number generator (RNG) or pooling schema. To portray the random event and outcome to the player, the gaming machine includes a primary display 12. If the wagering game is a reel slot game, for example, the primary display 12 includes a plurality of symbol-bearing reels that are rotated and stopped to place symbols on the reels in visual association with the pay line.

The primary display 12 may be implemented with a CRT, LCD, plasma, electro-mechanical reels (in the case of a mechanical reel slot game), or other type of display known in the art. The primary display 12, especially if implemented in video, may be overlaid with a touch screen to facilitate interaction with the player. In the illustrated embodiment, the gaming machine 10 is an "upright" version in which the primary display 12 is oriented vertically relative to the player. Alternatively, the gaming machine may be a "slant-top" version in which the primary display 12 is slanted at about a thirty-degree angle toward the player of the gaming machine 10.

FIG. 2 is a block diagram of a control system suitable for operating the gaming machine. Bill input device 22 or coin input device 23 signals a central processing unit (CPU) 20 when a player has inserted money or played a number of credits. Using a button panel 16 the player may select any variables associated with the wagering game and place his/her wager to purchase a play of the game. In a play of the game, the CPU 20 generates at least one random event using a random number generator (RNG) or pooling schema and provides an award to the player for a winning outcome of the random event. The CPU 20 operates the display 12 to represent the random event(s) and outcome(s) in a visual form that can be understood by the player. In addition to the CPU 20, the control system may include one or more additional slave control units for operating the display 12 and any secondary displays.

Card input device 25 is used for player tracking. A player inserts a card into the device and the machine communicates information to the player through the card reader display 27. Ticket dispenser 26 is used to present the player with an alternative to coins or tokens when cashing out. Many ticket devices also allow the insertion of a ticket containing a value that is applied to the credit counter and used to start or continue play. Thus, tickets represent cash and player transactions occur using tickets when offered by the machine and casino.

System memory 24 stores control software, operational instructions and data associated with the gaming machine. In one embodiment, the system memory 24 comprises a separate read-only memory (ROM) and battery-backed random-access memory (RAM). However, it will be appreciated that the system memory 24 may be implemented on any of several alternative types of memory structures or may be implemented on a single memory structure. A payoff mechanism 18 is operable in response to instructions from the CPU 20 to award a payoff to the player. The payoff

may, for example, be in the form of a number of credits. The number of credits is determined by one or more math tables stored in the system memory 24.

FIG. 3 is an exploded perspective view of a main display assembly for a mechanical reel slot machine. The four main components comprising this assembly are a face frame 32, a plastic bezel 28, a display glass 30, and a mechanical reel display assembly 34. Referring to FIG. 1, the display glass 30 and the plastic bezel 28 are shown. As identified previously, these two components are areas that potentially allow emission and interference on the gaming machine.

FIG. 4 is a representation of a plastic display bezel 28. As noted previously, plastic, a non-conductive material, requires the addition of some type of shielding substance to prevent emission and interference. In the past, a metallic strip has been added to the reverse side of the bezel to provide additional shielding. Typically, this adds production time and cost to the bezel and because plastic has a different composition and is formed easily and cheaply compared to metal, the additional shielding plate does not usually provide complete coverage.

Two options are presented to minimize the risk of interference through plastic bezels on the gaming machine. The first is a conductive plastic. Metal, or other conductive fibers such as carbon, impregnated in the plastic compound are very effective as a conductive shield. Low amounts are sufficient to fulfill most specifications and regulations for EMI. Potters Industries, Inc., Valley Forge, PA and Cybershield, Inc., Dallas, TX are two suppliers of this type of technology.

The second option is a conductive coating, such as a conductive additive to paint, used to finish the plastic bezels. This is commonly referred to in the industry as "conductive paint". Conductive paints generally have lower production costs compared to other shielding technologies. Conductive paint can be sprayed on to plastic using an air atomizer or airless spray equipment. The spray pattern and paint thickness can be tailored for each application to provide optimal shielding performance versus cost.

There are a variety of conductive paints available today: nickel, copper, silver, and silver-plated hybrids. Copper paints provide midrange shielding and conductivity performance and are the most cost effective. Thickness and uniformity determine shielding effectiveness of conductive paint. Seleco, Inc., Indianapolis, IN and Cybershield, Inc., Dallas, TX are two providers of conductive paint.

FIG. 5 is a front view of a prior art display glass (akin to display glass 30) showing the placement of copper tape 36 on the display glass. While this method reduces the amount of interference passing through the glass, it does not reduce it significantly, especially in the areas where the tape is not present. For example, the three windows 38 in the center of the display glass 30 allow the player to view mechanical reels. The obvious lack of any shielding in this area and the electro-mechanical nature of the reels could present a threat of external interference from an object such as a magnet or electro-magnetic discharge. The bulk of the area of the display glass 30 does not contain copper 36 tape due to the translucent nature of the artwork typically presented there. Because internal light sources illuminate the artwork, copper tape would interfere with the presentation.

FIG. 6 is a cross-sectional view of the display glass 30 and the plastic display bezel 28. A conductive thin film or applied coating 40 is adhered to the display glass 30. Also in this example, a conductive paint 50 is applied to the plastic bezel 28. The property of thin film conductive material is such that most emissions are not absorbed. Instead, interference is reflected off of the material.

A variety of methods exist to create the layered composition of the display glass with transparent shielding and different types of conductive materials can be used with varying results depending on the level of shielding versus the transparency required for the particular application. Two examples of the shielding types are thin wire mesh and the incorporation of Indium Tin Oxide (ITO) into a layered thin film coating. Wire mesh provides a reasonable solution; however, it is more applicable to prevent emissions than to provide immunity. It is also less transparent than ITO. A display glass containing ITO provides consistent coverage, excellent transparency, and a greater shielding effectiveness than wire mesh, copper tape, and nothing at all.

To best understand the effectiveness of display glass containing ITO, a comparison with an unshielded display glass, a display glass containing copper tape, and a display glass containing ITO shows an incremental improvement in shielding capability. By way of experiment, a far field signal was passed through an unshielded display glass measuring 10.15 inches high by 18.46 inches wide (surface area of 187.37 square inches). Measurements were taken and entered into a calculation to determine shielding effectiveness (SE) in decibels (dB) for a range of 30 MHz to 1 GHz. The SEdB of this test was 0 or no shielding effectiveness at all. The same test was performed on the display glass with copper tape located in specific, non-visible

areas. The SEdB improved to 7. However, as will be appreciated by those with ordinary skill in the art, specific, non-shielded areas of this example are still susceptible to near field interference or leakage. Finally, the test was performed on the same display glass as the (surface area of 187.37 square inches) with a thin film coating containing ITO. The result was a SE improvement of 7 dB (again, over the glass with no shielding) however, unlike the glass with copper tape, the ITO glass display maintained a consistent SE across the entire glass area and is far less susceptible to near field interference.

As will be appreciated by those with ordinary skill in the art, results will vary depending on the type of glass, the thickness, and the surface area. Yet, the improvement from no shielding and copper tape shielding to the ITO thin film coating is consistent in any test or application. The superior transparency, consistent shielding across the entire surface, and elimination of the production steps regarding copper tape make the thin film shield coating the superior choice for interference control.

A number of manufacturers offer ITO coatings for display glass including VisionTek Systems, Chesire, UK and MTR Technologies, Brookings, SD.

While the present invention has been described with reference to one or more particular embodiments, those skilled in the art will recognize that many changes may be made thereto without departing from the spirit and scope of the present invention.

For example, other externally exposed devices on a gaming machine require plastic bezels as a finishing method. They include, but are not limited to, bill input devices, card readers, card reader displays, ticket readers/dispensers, and secondary displays. Such bezels may also benefit from the application of conductive paint or impregnation of conductive material because the mechanisms to which they are associated are, in many cases, electromechanical and are susceptible to interference. Secondary displays requiring shielding may also use the transparent conductive film.

Another alternative to the previously described display glass with an ITO coating is to use a second piece of glass behind the display glass. This second piece of glass would contain the ITO coating while the display glass would only contain the artwork for the display. The ITO glass position behind the display glass prevents the corruption of its integrity from outside sources.

Each of these embodiments and obvious variations thereof is contemplated as falling within the spirit and scope of the claimed invention, which is set forth in the following claims.